## ABSTRACT

Disclosed are nanometer to micron scale functionalized apertures constructed on a substrate made of glass, carbon, semiconductors or polymeric materials that allow for the real time detection of biological materials or chemical moieties. Many apertures can exist on one substrate allowing for the simultaneous detection of numerous chemical and biological molecules. One embodiment features a macrocyclic ring attached to cross-linkers, wherein the macrocyclic ring has a biological or chemical probe extending through the aperture. Another embodiment achieves functionalization by attaching chemical or biological anchors directly to the walls of the apertures via cross-linkers.